may be generalized attrition of the nerve fiber layer, small slit-like defects or sector-shaped defects. Obviously, one or more of these conditions may co-exist. Of course, those diseases which cause only focal destruction of nerve fiber bundles will produce the most obvious defects, because a nerve fiber layer of normal density will provide clear contrast to the area of the defect; focal defects are much more difficult to observe against a background of generalized attrition.

Preliminary studies have already shown the value of this technique in the study of patients with optic nerve disease, glaucoma and ocular hypertension, papilledema, toxic amblyopia and congenital hemianopia.

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Amaurosis Fugax and Its Significance

AMAUROSIS FUGAX is a term signifying transient episodes of monocular blindness. Scattered references extending over a hundred years indicate that at least a few physicians recognized the etiologic implications. Practical appreciation began after 1951 when an article entitled "Transient Monocular Blindness Associated with Hemiplegia" by Fisher in Boston related premonitory blindness as a significant warning of impending stroke. Since many persons experience amaurosis fugax without later development of cerebrovascular accidents, the immediate practical question was how to select those patients who, if untreated, would experience such difficulties.

The typical episodes involve only one eye at a time, last only a few minutes (usually less than five) and, contrary to expectations derived from Fisher's 1951 article, are unassociated with concurrent hemiplegia. In any age group, amaurosis fugax is an indication for obtaining a general health assessment, paying particular attention to possible sources of embolic disease (rheumatic heart disease, subacute bacterial endocarditis), hematologic disorder and vasculitis. Signs and symptoms of neurological dysfunction should be sought. When amaurosis fugax occurs in otherwise healthy young adults (particularly in men), the cause often remains mysterious and episodes are likely to disappear gradually even after occurring for many years.

In middle-aged and older persons, especially those in whom there is a predisposition to significant vascular disease engendered by hypertension, diabetes mellitus or hyperlipidemia, it may be difficult to know with certainty how far to pursue evaluation. Unfortunately, the frequency and severity of amaurosis fugax episodes provide little help, since symptoms may be mild in the presence of surgically correctable, severe disease. Safe and simple tests, such as ophthalmodynamometric determinations of ophthalmic arterial pressure, are prone to false negative results due to collateral circulation. Furthermore, while ophthalmodynamometry may give some indication of significant carotid stenosis, it gives no reliable indication at all of the presence or absence of an ulcerating atherma periodically discharging showers of cholesterol plaques or soft platelet emboli. While a number of investigators are at work attempting to develop sophisticated, noninvasive, electronic tests of carotid and intracranial blood flow, carotid angiography remains the reliable way to study blood flow to the head.

At present, several points may be made about the condition:

- Amaurosis fugax is recognized as an important indicator of possible carotid arterial disease.
- Such carotid disease is frequently extracranial, consisting of stenotic and/or atheromatous ulcerating lesions close to the carotid bifurcation.
- These lesions may be approached with a high degree of safety and success by vascular surgeons performing endarterectomies and grafts.
- In order to find the lesions, carotid angiography is most useful. Despite a considerable risk of complications in the early days, carotid angiography performed by modern techniques is a relatively safe procedure.
- Very safe and sensitive, nonangiographic procedures for estimating abnormalities of carotid blood flow may be applied in the future to detection of primarily stenotic lesions. However, normal values may give a false sense of security when the principal difficulty is embolic rather than stenotic.

• Aspirin may help some patients whose amaurosis fugax is not due to surgically amenable lesions, by lessening platelet aggregation.

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Time Released Medication for Glaucoma

CONTROL OF GLAUCOMA using topical medication has historically been achieved by the use of medications instilled into the conjunctival sac at varying rates of frequency—depending upon the drug used and the requirements of the patient. During the night treatment is usually reduced and, therefore, control during these hours is less certain. Various drugs and vehicles have been used to reduce to a minimum the number of instillations required in 24 hours. Physostigmine, demecarium bromide, echothiophate, pilocarpine and other antiglaucoma medications have been combined with ointment bases or in vehicles containing polyvinyl alcohol, methylcellulose or Absorbobase.® Contact is claimed to be prolonged and therefore the agents are effective for a longer period of time. It is likely that toxic levels of the drug occur with each instillation while therapeutic levels are achieved only part of the time with pulse therapy.

As a natural evolution, new systems of delivery have been investigated. Among these are administration by saturated hydrophilic contact lenses; through a copolymeric membrane permitting passage of drugs at a predetermined rate; through devices that hydrolyzed, releasing medication and degrading to self-destruction, or by the use of capsules with two compartments—one absorbing water by osmosis then, by expansion into the second chamber, forcing medication out through an opening calculated to deliver a therapeutic dose.

To date the only system available is the Pilocarpine Ocusert.® This wafer-shaped device consists of a core of pilocarpine and alginic acid surrounded by a copolymeric membrane. In a watery atmosphere (tears) the drug passes out of the core at a preset rate. Alterations in the nature of the copolymeric membrane can be made to control the release rate. Two Ocuserts® are now available: Pilo-20 and Pilo-40. The Pilo-20 Ocusert® releases pilocarpine at 20 micrograms (μg) per hour and the Pilo-40 at 40 μg per hour. Therefore, the amounts of drugs required with this delivery system are some 10 to 25 times less than with pilocarpine drops. There is also the theoretical advantage that the drug is being delivered day and night.

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Studies of the Optic Nerve Head in Glaucoma

RECENT ADVANCES in clinical evaluation of the optic disc place emphasis on the three dimensional morphology of the optic cup and the differentiation of the amount of pallor from the extent of cupping.

Studies on the qualitative appearance of the cup in the early stages of glaucoma have described the processes of central deep atrophy and upward-downward extension. The former occurs in discs with congenitally small cups which, before the onset of atrophy, did not extend to the lamina and is manifested by a "moth-eaten" appearance of the prelaminar nerve head tissue with apparent deepening of the cup in that central area. Upward or downward extension can be detected by the presence of vertical ovality of the cup which is measured by a greater vertical than horizontal cup to disc ratio. Thorough evaluation of the nerve head is increasingly dependent on the use of the slit lamp with which a stereo view can be obtained.

Using this instrument it is also possible to distinguish between the size of the optic cup and the degree of pallor. Unfortunately, use of the monocular direct ophthalmoscope to observe the disc may easily disguise the difference between these two parameters since it does not provide a good three dimensional view. Because the area of pallor